



Australian Government

Australian Transport Safety Bureau

Derailment of freight train 9T92

Near Julia Creek, Queensland, 27 December 2015

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Addendum

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The occurrence

The information contained in this Preliminary report is released in accordance with section 26 of the Transport Safety Investigation Act 2003 and is derived from the ongoing investigation of the occurrence. Readers are cautioned that new evidence will become available as the investigation progresses that will enhance the ATSB's understanding of the accident as outlined in this Preliminary report. As such, no analysis is included in this report.

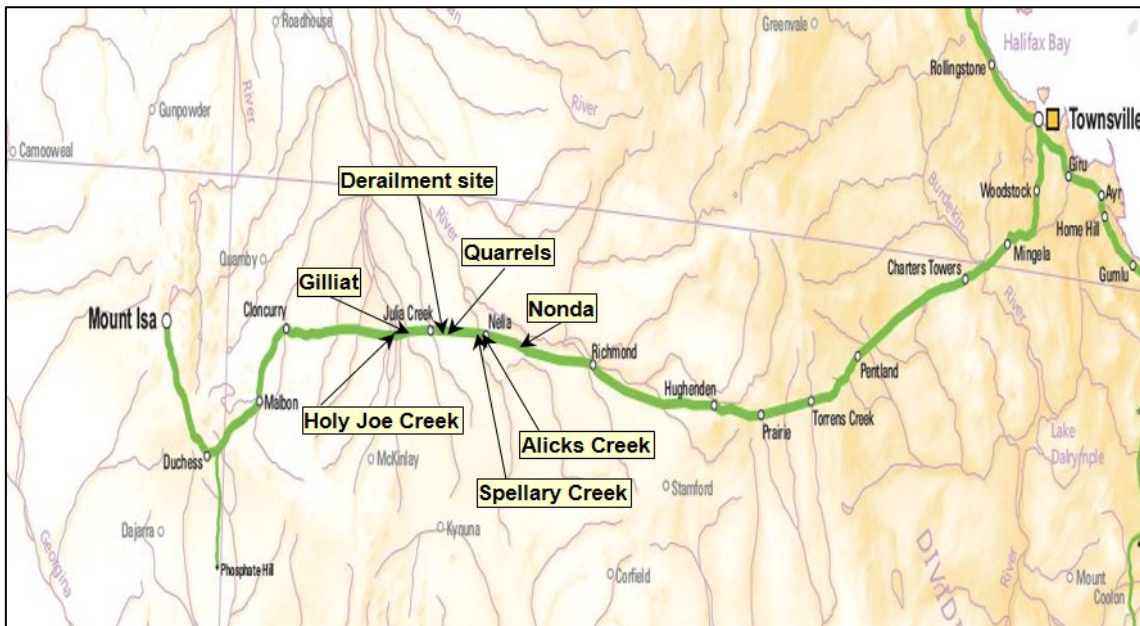
Events prior to the derailment

In late December 2015, a tropical low embedded on an active monsoon trough extending across the tropical north of Australia. This weather system brought heavy rainfall to northern Australia and caused moderate rainfall in the northwest, northern, and southern areas of Queensland.

At about 0245¹ on 27 December 2015, the Queensland Rail (QR) Network Control Officer (NCO) for the Townsville far-west train control board received an intermittent alarm from the Rail Management System. The alarm indicated a high water level at the Holy Joe Creek located at the 681 km point, west of Julia Creek (Figure 1).

About the same time, the crew of Aurizon train 9E56, travelling toward Julia Creek from the east, contacted the NCO to report encountering heavy rainfall around Nonda, located at the 561.340 km point, east of Julia Creek. The NCO recorded details of the alarm and the report from 9E56 on the train control graph.²

Figure 1: Locations, Mount Isa railway, Queensland



Railway connecting Townsville and Mount Isa, including the branch line toward Phosphate Hill. Train 9E56 was travelling west and was about 4.5 hours ahead of train 9T92. Train 9T92 was travelling from Townsville to Phosphate Hill but derailed about 20 km east of Julia Creek. Source: Geoscience Australia ©. Annotated by ATSB

Also at about 0245, the Aurizon crew involved in the derailment commenced their shift at Hughenden. The crew was to operate Aurizon train 9T92 (loaded with sulphuric acid) from Hughenden through Julia Creek to Cloncurry. Following the arrival of 9T92 from Townsville, the crew took control and after receiving authority from the NCO, departed for Cloncurry at about 0330 that morning. Train 9T92 was following about 4.5 hours behind the preceding train 9E56.

¹ The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time (EST).

² A diagram showing operational information for a train control area.

At about 0400, a shift change of the NCO for the Townsville far-west train control board occurred. The incoming and outgoing NCO's performed a handover to provide a brief on the status of relevant train running information for that control area.

At about 0520, the crew of 9E56 reported more heavy rain on their arrival at Gilliat, located at the 664.260 km point, west of Julia Creek. Train 9E56 remained stopped at Gilliat to enable a QR track inspector to access the track at Cloncurry and travel to Gilliat. The track inspector's task was to examine the track for flood damage through to Gilliat, and to investigate the high water alarm at Holy Joe Creek before train 9E56 traversed the area.

The track inspector left Cloncurry at about 0645. The inspector made several reports to the NCO enroute to Gilliat, noting the presence of floodwaters at the locations that had triggered alarms. At about 0905, the track inspector completed the inspection to Gilliat; advising the NCO that the inspected track was fit for service — and the departure of train 9E56.

After crossing train 9E56 at Gilliat, the inspector obtained an authority to continue the inspection toward Julia Creek. The NCO gave authority to continue to Julia Creek and advised the track inspector that a cross was to occur with 9T92 at Julia Creek.

The derailment

While the track inspection was occurring to the west of Julia Creek, train 9T92 continued to approach Julia Creek from the east. At this time, there had only been a report of heavy rainfall in the area east of Julia Creek.

At about 0839, the crew of 9T92 reported to the NCO that they were approaching Nelia, located about 49 km east of Julia Creek. They reported there was plenty of water everywhere, and that they experienced periods of rainfall during the 212 km between Hughenden and Nelia. The NCO advised that the previous train 9E56 had reported similar conditions. As train 9T92 passed over Alicks Creek, located about 42 km east of Julia Creek the crew noted that there was a substantial water flow along that waterway. This area was known to Queensland Rail and the train crew as a flood 'hot spot'.

At about 0900 as train 9T92 approached Spellary Creek (about 32 km east of Julia Creek), the crew observed floodwaters pooling adjacent to the track formation ahead. The driver slowed the train; stopping about 815 m before Spellary Creek. The train crew noted light debris over the track, indicating that floodwater had overtopped the track formation at some time, before receding.

While stationary, the train crew changed drivers. Following the crew's assessment of the conditions ahead, the driver proceeded at a low speed through the affected area. The train crew had no immediate concern in proceeding as they could see the track and ballast, and the water adjacent the track was not flowing and appeared to be receding.

After traversing the affected area, 9T92 continued toward Quarrels. The train crew contacted the NCO at about 0920 to report 'water lapping ballast' at Spellary Creek between the 605 and 607 km points. They also reported their observation of light debris over the track, and that the floodwaters appeared to be receding.

In response to the floodwater report from the crew of 9T92, the NCO commenced arrangements for a track inspection from Richmond (behind 9T92) toward Julia Creek. The Queensland Rail Transit Manager at Townsville had also commenced arrangements to notify rail operators of the potential for service disruptions due to closing the track west of Richmond for the inspection.

At about 0926, the crew of 9T92 again contacted the NCO to report they were approaching Quarrels. The NCO acknowledged the communication and gave authority through Quarrels. After passing through Quarrels, the driver reduced speed to around 20 km/h to traverse a short section of track with a 25 km/h speed restriction. After clearing the speed restriction, the driver started to increase the speed of 9T92 toward the posted maximum track speed of 60 km/h west of the Quarrels loop. The track between Quarrels and Julia Creek was not an identified flooding hot spot.

At about 0933, with 9T92 travelling at about 51 km/h, one of the train crew saw a washout³ about 45 m ahead and called out a warning to the rest of the crew. The driver immediately moved the throttle to idle and moved the brake handle to the emergency position. Shortly after, the locomotive entered the washout. The crew felt the locomotive bounce and saw water splash on the windscreen before it derailed and began to tip over. As the locomotive tipped, the diesel engine shut down.

The pitching of the locomotive while traversing the washout and tipping, ejected the train crew from their seats. All crewmembers sustained minor injuries (cuts and abrasions) from contact with structures within the locomotive cab.

Events post-derailment

Train 9T92 had travelled about 2.6 km from Quarrels before encountering the washout. The locomotive came to rest on its side to the north of the track, about 68 m past the washout (Figure 2). The locomotive was laying in about 600 mm of pooled floodwater. All of the 26 trailing tanker wagons had also derailed to the north of the track and were laying in the pooled floodwaters.

Figure 2: Derailed train 9T92



The derailed locomotive 2814 and 26 trailing tanker wagons of 9T92 laying to the north of the railway about 20 km east of Julia Creek. The floodwaters present at the time of derailment had receded, however pooled water is visible in the drainage channels from culverts under the Flinders Highway leading toward the washout of the track formation. Source: Queensland Police Service

Immediately after the derailment, floodwater entered the cabin, before receding to a depth of about 600 mm. To escape the cab, the train crew attempted to break the front windcreens using

³ The washing out of earth by water from an embankment by heavy rain or a freshet.

the emergency hammer (Figure 3). After repeated strikes, they were unable to open an escape route through the windscreens, so the crew decided to climb up and out of the locomotive's side window.

The first crewmember, on exiting the locomotive, saw an acid plume rising from the derailed tankers about half way along the train. The plume extended to the north for about 200 m over the Flinders Highway.

The train crew did not have any breathing apparatus on board and given the presence of the plume, decided to evacuate the area urgently before the wind changed direction. The crewmembers assisted each other to climb from the locomotive cab before walking along the track formation towards Julia Creek.

Figure 3: Derailed locomotive 2814



Derailed locomotive 2814 situated on the northern side of the track. The damage to the inside surface of both windscreens was from numerous strikes using the supplied emergency hammer. The train crew were unable to break out the windscreens. The train crew escaped from the locomotive through climbing up and out the sliding side window. Source: Queensland Police Service

The floodwaters and saturated ground provided limited opportunities for the train crew to access the Flinders Highway. About 800 m from the locomotive there was a small rise that allowed the crew to cross to the highway.

During the derailment, the radio handsets had fallen into the water and the train crew had no other serviceable communications equipment available to them. The train crew waited on the Flinders

Highway until a motorist travelling along the highway arrived at their location. A crewmember borrowed a mobile telephone from the motorist and contacted the Aurizon Team Leader at Cloncurry to advise that train 9T92 had derailed. The Team Leader also telephoned the emergency services.

At about 0950, the Team Leader contacted the Aurizon Service Delivery Supervisor to relay information of the derailment.

Around the same time, the NCO had expected train 9T92 to have arrived at Julia Creek. Unaware of the derailment, the NCO had commenced a series of radio and telephone calls in an attempt to raise the crew of train 9T92 and establish its location. At about 1022, the NCO received advice from the Aurizon Team Leader that train 9T92 had derailed about 20 km east of the Julia Creek township.

About 20 minutes later, emergency services arrived to attend to the train crew and take control of the derailment site.

The QR rail transit manager reported the derailment internally and contacted representatives of the Incitec Pivot⁴ emergency response team at Phosphate Hill. Due to the closure of the Flinders Highway due to flooding, the emergency response team was unable to respond immediately to the incident.

At about 1815, the emergency response team arrived at Julia Creek and commenced preparations to assess the damage to the tanker wagons, the extent of product leakage and arrangements for its containment. The presence of floodwaters across the Flinders Highway and saturated soil conditions at the derailment site restricted ready access by Queensland Rail, Incitec Pivot and other response teams. Assessment and recovery operations continued for several weeks following the derailment.

⁴ Incitec Pivot Limited owned the GTAX tanker wagons and the sulfuric acid consignment.

Context

The location

The derailment occurred about 20 km east of Julia Creek at the 617.190 km mark on the main line between Townsville and Mount Isa. The derailment site was located approximately 350 km east of Mount Isa and 617 km west of Townsville by rail.

Train and train crew information

Train 9T92 was a freight service operated by Australia Eastern Railroad (Aurizon) between Townsville and Phosphate Hill. It consisted of one locomotive (2814) hauling 26 freight tanker wagons. Incitec Pivot Limited owned the GATX freight tanker wagons and the consignment. The train was 354.3 m in total length and had a trailing mass of 2028 t.

The consignment of train 9T92 contained dangerous goods (819,000 litres of sulphuric acid), of which there was a loss of containment of about 60,800 litres due to the derailment.

The train was crewed by a driver and assistant driver. Another driver was also travelling in the locomotive cab to obtain route knowledge along various track sections. All drivers commenced work at Hughenden at about 0245 on the 27 December 2015. They were to take control of train 9T92 at Hughenden and drive through to Cloncurry, where they would finish their shift.

The crew operating train 9T92 at the time of the derailment held the required competencies for the tasks being performed and had been assessed as fit for duty in accordance with the requirements of the *National Standard for Health Assessment for Rail Safety Workers*.

Aurizon tried to initiate screening tests on the train crew for the presence of a drug or alcohol testing following the derailment. However, due to flooding and the incident response, this could not be performed. Aurizon arranged to perform the tests at hospital but this was not completed.

The driver of train 9T92 on realising the presence of a washout ahead acted immediately in braking the train. There was no anomaly identified in the train speed, handling, rolling stock condition, or operational performance leading up to the derailment.

Track information

Queensland Rail (QR) manages the railway where the derailment occurred, with the movement of rail traffic controlled from the QR Control Centre located at Townsville in Queensland.

The narrow gauge (1,067 mm) track at the derailment location consisted of 41 kg/m rail fastened to steel sleepers by resilient clips. The track formation was comprised of black vertosol⁵ soil overlaid with ballast to a nominal design depth of 200 mm forming the track bed.

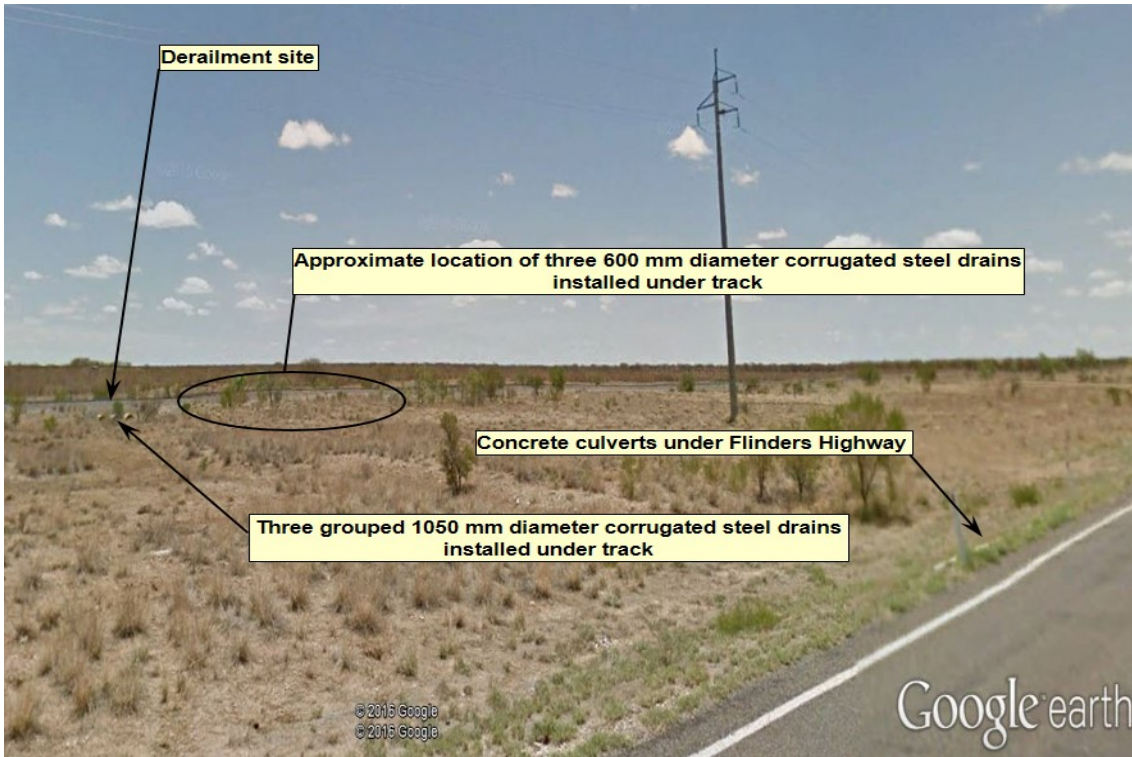
Approaching the derailment site from Quarrels, the track was tangent and the terrain relatively flat and open. The track gradient was a falling grade of 1 in 1649, before transitioning to level through the area adjacent the derailment location.

Track drainage

At the derailment site (617.190 km), there was a grouping of three 1050 mm diameter corrugated steel pipes installed under the track formation (Figure 4). Immediately west of the site three additional 600 mm diameter corrugated steel pipes were installed at about 10 m intervals (617.200, 617.210, 617.220 km).

⁵ Clay soils with shrink-swell properties that exhibit strong cracking when dry.

Figure 4: Under-track drainage at the derailment site



Location of the derailment as it appeared before the event - viewed in a south-westerly direction from the Flinders Highway. Rainwater runoff flows from the catchment to the north, passes through a series of concrete culverts under the highway and toward the railway formation. A series of circular corrugated steel pipes installed under the track formation allows water to then flow into the watercourses located to the south of the railway. Source: Google Earth, annotated by ATSB

Wet weather operational procedures

Queensland Rail had implemented a variety of systems and operational procedures/protocols to detect and respond to a weather event that may affect track infrastructure and/or train operations.

These measures were aimed at providing the NCO with information on conditions affecting the network and guidance for its management. For an identified flood affected area, the procedures empowered the NCO to stop rail traffic and arrange an inspection of the track infrastructure in the flood affected area.

On the day of the derailment, the NCO implemented these procedures in response to the high water level alarm at the Holy Joe Creek (west of Julia Creek). That is, train 9E56 was held at Gilliat and a track inspection was initiated between Cloncurry and Julia Creek.

Similarly, the operational procedures required the train crew to operate in response to the current conditions and promptly report to the NCO any observed condition with the potential to affect the network. The NCO could then consult with the train crew, Track Maintenance Supervisors (track inspectors), and use any other resources available to establish a broad understanding of the issues which may affect the running of rail traffic.

The crew of train 9T92 reported weather-related conditions enroute, including their assessment of the floodwater at Spellary Creek (east of Julia Creek). The NCO implemented procedures in response to this information. That is, further rail movements were prevented from entering the affected track section and a track inspection was initiated between Richmond and Julia Creek.

Ongoing investigations

The investigation is continuing and will include an examination of the following:

- The magnitude of the rainfall event that likely occurred immediately prior to the passage of 9T92.
- The organisational systems and procedures to identify, monitor and respond to a weather event.
- The organisational systems and procedures to manage the interface between adjacent flood water drainage systems.
- The adequacy of track drainage arrangements to satisfy relevant standards and current rainfall average recurrence interval.
- The training programs for train crew to identify and respond to consequential hazards from a significant weather event.
- The arrangements for train crew egress from the locomotive cab and communication in an emergency.
- The adequacy of rolling stock (tanker) crashworthiness and maintenance arrangements.
- Human performance and behavioural factors that may have contributed to the incident.

Preliminary findings

From the evidence available, the following *preliminary* findings are made with respect to the derailment of train 9T92 that occurred about 20 km east of the Julia Creek, Queensland on 27 December 2015. These findings should not be read as apportioning blame or liability to any particular organisation or individual. These findings are subject to revision as new information comes to hand during the continuing investigation.

Safety issues, or system problems, are highlighted in bold to emphasise their importance.

A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- Scouring of the ballast and formation adjacent to the 617.190 km point by floodwater meant that the track could not support the weight of train 9T92 as it passed over the affected area. The resulting deformation in alignment of the track initiated the derailment.

Other findings

- There were no anomalies identified with the train speed, handling, rolling stock condition, or operational performance preceding the derailment.
- Queensland Rail's management of operations in response to the wet weather event was generally in accordance with the organisation's existing policies and procedures.

Safety actions

Additional safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Aurizon

Aurizon have advised that respiratory protection masks have been introduced on trains transporting acid. Additionally, Aurizon have commenced a review of emergency evacuation procedures, locomotive windscreens, and secondary communication opportunities/options.

General details

Occurrence details

Date and time:	27 December 2015 – 0933 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Derailment	
Location:	About 20 km east of the Julia Creek township, Queensland	
	Latitude: 20°39'13.5"S	Longitude: 141°56'52.4"E

Train details

Train operator:	Australia Eastern Railroad (Aurizon)	
Registration:	9T92	
Type of operation:	Freight	
Persons on board:	Crew – 3	Passengers – 0
Injuries:	Crew – 3	Passengers – 0
Damage:	Substantial	

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Australia Eastern Railroad (Aurizon)
- Bureau of Meteorology
- Incitec Pivot
- Queensland Police Service
- Queensland Rail
- Queensland Department of Transport and Main Roads (Rail Regulation)
- Train crew of 9T92

References

- Bureau of Meteorology Monthly Weather Review - Australia December 2015 Product code IDCKGC17R1. Prepared on 9 February 2016, ISSN 1836-3067
- RISSB National Guideline Glossary of Rail Terminology, 3 December 2010

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to:

- Australia Eastern Railroad (Aurizon)
- Bureau of Meteorology
- Incitec Pivot
- Queensland Police Service
- Queensland Rail
- Queensland Transport and Main Roads (Rail Regulation)
- Witnesses and individuals

Submissions were received from Australia Eastern Railroad, Incitec Pivot, Queensland Rail, Queensland Transport and Main Roads (Rail Regulation), and the crew of train 9T92. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.